CHAPTER 7

USES OF LICENSING BY STATE AND LOCAL AGENCIES

Federal, state and local agencies use the licensing system to restrict certain activities to persons with a specific background or set of skills, to define advisory board memberships and to provide restrictive definitions for some specialties within engineering. Examples of prescriptive statements limiting specific activities to a particular type of engineer include[1]:

- A civil engineer shall prepare comprehensive soils and engineering geologic investigations. (Sec.13.03. "G" Surface Mining Operations Districts of the Los Angeles County Code)
- A civil engineer establishes standards for sight distance and riding qualities, prepares soil reports of hillside areas and a preliminary soil report based on testing. (Sec.17.05 Design Standards of the Los Angeles County Code)
- A civil, structural, geotechnical (when the work is supplementary to civil engineering) or electrical engineer or architect prepares, seals and signs plans and specifications. (Sec.93.0206. Plans and Specifications of the Los Angeles County Code)
- A professional engineer shall prepare a report on structural integrity for wireless telecommunication facilities. (Sec.12.21.General Provisions of the Los Angeles County Code)
- A fire protection, mechanical or civil engineer or architect may coordinate and verify all components of the smoke-control system within his or her area of expertise. (Sec.2.6 Smoke Control Systems-Submittal Requirements or the San Francisco Municipal Code)
- A soils, civil or chemical engineer, an engineering geologist, hydrologist, industrial hygienist, or environmental assessor shall determine whether hazardous wastes are likely to cause environmental, health, or safety risks and recommend mitigation reports. (Sec.1228. Applicant's Responsibility Upon Discovery of Hazardous Wastes of the San Francisco Municipal Code)
- A civil, traffic or division engineer directs preparation of "Worksite Traffic Control Plan." (Sec.62.250. Rail Transit Construction Impact of the Los Angeles County Code)
- A petroleum engineer determines the value of proven reserves (Sec.260.140.122.2 Net Worth of the California Code of Regulations)
- A professional engineer certifies that closure is compliant (Sec.66264.143.Financial Assurance for Closure of the California Code of Regulations)

Some examples of restrictive definitions include:

- A city engineer shall be a registered civil engineer with 5 or more years of experience. (Sec.22.341.City Engineer.Qualifications of the Los Angeles County Code)
- A soil engineer shall mean a civil engineer experienced in the application of the principles of soil mechanics or a geotechnical engineer.(Sec.91.220.S of the Los Angeles County Code)

[1] See Appendix D for complete excerpt

- A qualified engineer shall mean a civil engineer. (Sec.64651.66. Qualified Engineer of the California Code of Regulations)

Examples of specifications for advisory board membership include:

- A fire protection engineer shall be a member of the board of examiners for high rise sprinklers. (Sec.4.14 Retroactive sprinkler requirements for existing high-rise buildings of the San Francisco Municipal Code)
- The variance board shall include a mechanical, acoustical, or civil engineer, physician (qualified in physiological effects of noise), audiometrist. (Sec.2910.Variance Board Establishment; Functions; Standards; Procedures of the San Francisco Municipal Code)
- The Building Inspection Commission shall include an architect and structural engineer. (Sec.D3.750-1 Commission; Composition of the San Francisco Municipal Code)
- The Engineering Criteria Review Board shall include a civil engineer, a structural engineer, an architect. (Sec.10271. Membership and Function of Engineering Criteria Review Board of the California Code of Regulations)

The first part of this chapter describes the results of online searches of the California and Federal Code of Regulations and the codes for three of California's largest counties -- Los Angeles, San Diego and San Francisco. The search terms included 16 engineering specialties registered in California and three generic phrases used in these codes (professional engineer, registered professional engineer and licensed professional engineer). The specialties include:

Agricultural Engineer	Manufacturing Engineer
Chemical Engineer	Mechanical Engineer
Civil Engineer	Metallurgical Engineer
Control Systems Engineer	Nuclear Engineer
Electrical Engineer	Petroleum Engineer
Fire Protection Engineer	Soils Engineer
Geotechnical Engineer	Structural Engineer
Industrial Engineer	Traffic Engineer

All titles (Titles 1 through 28) in the California Code of Regulations (CCR) except Title 6 and 24 were searched. (See Appendix E.) Title 24 (the California Building Code) is not available in electronic format. Counts for professional engineers were adjusted so that the same "hit" was not counted twice for professional engineer and registered professional engineer or professional engineer and licensed professional engineer. Mentions or "hits" in Title 16, which includes the Professional Engineer's Act, are included in Table 7.2 but removed from the remaining tables. Title 16 refers almost exclusively to professional engineers (27 references), and to civil and structural engineers (18 and 17 respectively). Petroleum engineers receive a single mention -- the only title act discipline to be mentioned at all in Title 16. (Table 7.1) Appendix F contains a list of the state agencies included in the CCR. Sections listing types of engineers that are subject to the conflict of interest code or those referring to pay schedules are included in the unedited comparisons but omitted from the edited ones. The CCR produces a hit for each mention of a phrase, while the county codes produce a hit for each section of law. To ensure comparability with county codes, duplicate references to the same section and required activity

were removed from the CCR file. References in the county codes to engineering rather than engineers were removed as well.[2]

The California State Personnel Board also uses the licensing system to define appropriate qualifications for engineering job class categories. These are job classes resulting from a search of the State Personnel Board's online Classification Information Search System using the term "engineer" and which also had a minimum education requirement of a four-year college degree in engineering. Using this definition, 194 engineering job classes were identified. Education and registration requirements were obtained from the online classification specifications that include qualifications for the job.

The second part of this chapter describes the distribution of engineering job classes and the proportion that require a registered engineer and the proportion of permanent civil service employees in positions requiring registration. This would indicate the relative importance the state places on hiring registered engineers.

Analysis of Federal, State and County Codes

Comparison of Unedited "Hits"

The Federal Code of Regulations (FCR) was too cumbersome to summarize with the same degree of precision applied to the California state and county codes. As a result, a discipline summary of hits in the FCR appears only in Table 7.2. For comparability, state and county code hits in Table 7.2 are unedited, counting multiple mentions in the same section, Title 16 references and references in the county codes to "engineering" rather than "engineers." The remaining tables are based on edited counts as described above.

The most obvious difference between the FCR and California's CCR and county codes is that civil engineers are mentioned far more often in California than they are in the FCR. Between 27% and 41% of the hits in California jurisdiction codes mention civil engineers compared with only 8% of the hits in the FCR. (Table 7.2) Similarly, structural engineers are mentioned between 3 and 6 times more often in California codes than they are in the FCR, with proportions ranging between 8.8% and 17.1% in California compared with 2.8% in the FCR. Geotechnical or soil engineers also appear more often in the California codes, especially in Los Angeles (26%) and San Diego counties (39%), compared with 2.5% of hits in the FCR.

Although mentioned less often, the pattern is the same for electrical and mechanical engineers. They constitute 0.6% of hits in the FCR, but occur much more often in the California codes. Electrical engineers make up between 1.8% and 6.8% of hits in the California jurisdictions while mechanical engineers, with one exception, account for 3.3% to 13.6% of them. San Diego County is the exception; their codes do not mention mechanical engineers.

Chemical, fire protection, petroleum and traffic engineers are the only title act disciplines mentioned in the state and county codes. Fire protection and chemical engineers are mentioned most often in San Francisco (11.4% and 2.3% respectively) while traffic engineers are mentioned more often in Los Angeles and San Diego (15.6% and 5.3%). Petroleum engineers are the only specialty that is mentioned more often in the FCR than in any of the

[2] The CCR does not produce hits for "engineering" when "engineer" is the search term, so the definitions for the title act disciplines in Title 16 are not included.

state's codes (2.8% of FCR hits, but 0.9% of CCR hits and no mention at all in the county codes).

The generic phrase of choice in the FCR is "registered professional engineer" (58% of all hits) whereas in the CCR, the most common term is "professional engineer" (30%). There is much less emphasis on being registered or licensed in the California code (11.4% vs. 63% in the federal code). (Table 7.2)

Comparison of Edited "Hits"

Within California, the most frequently mentioned type of engineer in all four jurisdictions studied was the civil engineer. The number of mentions in county codes ranged from 37% to 45% while the term appeared in 35% of CCR hits. Geotechnical or soils engineers were mentioned almost as often in Los Angeles and San Diego county (32% and 43% respectively), while structural engineers were the second most frequently mentioned specialty in San Francisco and the CCR (15% and 22%). Electrical, mechanical and geotechnical engineers are mentioned with similar frequency in the CCR (5.7%, 4.1% and 3.6% respectively). Electrical engineers received a similar number of hits in San Francisco and Los Angeles counties (3.8% and 3.5%), but none in San Diego. Mechanical engineers were mentioned more often in San Francisco (12%) than in the CCR, but weren't mentioned at all in the other two counties. Fire protection and chemical engineers were the only title act disciplines mentioned in San Francisco (11.5% and 3.8% respectively) and traffic engineers the only one mentioned in Los Angeles (1.8%). No title act disciplines appeared in the San Diego County code. Chemical, petroleum and fire protection engineers are the only title act disciplines mentioned in the CCR (1.6%, 1.6% and 1.0% respectively). (Table 7.3)

Generic titles appear more often in the CCR than in the county codes. In the edited references, the term of choice becomes "registered professional engineer" in both the state and county codes. However, edited references in the CCR identify first, civil engineers (35%), then structural engineers (22%) and third, registered professional engineers (18%). (Table 7.3)

Types of References

Most of the references to engineers are prescriptive statements (90% in the CCR and 84% in the county codes). These define what kind of engineer is required to perform specific tasks. At both the state and county level, a little over a third of these statements specify a civil engineer (36.8% of the references in the CCR and 40% of those in the county codes). Structural engineers and registered professional engineers are each specified in roughly one in five references at the state level, while geotechnical engineers are referred to almost a third of the time in the county codes (32%). Prescriptive statements rarely refer to title act disciplines (3.4% and 3.6% of the state and county codes respectively). (Table 7.4)

Board memberships are prescribed in 6% of the CCR hits and in 8% of those at the county level. At the state level, these primarily refer to structural, electrical and mechanical engineers (20% each with a sample of 10 cites). Civil and structural engineers are more often required on boards at the county level (33% each), with a sample of 9 cites. (Table 7.4)

At the state level, restrictive definitions apply to civil engineers, the two title authorities (geotechnical and structural) and professional engineers (22% each in a sample of 9), while at the county level, all 12 are concentrated in civil and geotechnical engineers. (Table 7.4)

When individual counties are considered, all three focus on civil engineers (with 35% to 43% of prescriptive statements), but Los Angeles and San Diego have similar proportions of prescriptive statements referencing geotechnical engineers (27% and 46% respectively). San Francisco mentions mechanical and fire protection engineers as often as they do geotechnical and structural (10.5% each), while Los Angeles is the only county to reference traffic engineers. (Table 7.5)

Analysis of Registration Requirements in State Personnel Board Engineering Job Classes

Out of 194 job classes specifying an engineer with a four-year college degree in engineering, 40% require that engineer to be licensed. The most common requirement is for a registered civil engineer (39% of the job classes with a registration requirement) with another 25% requiring a registered professional engineer. Registered electrical engineers are required in another 10% of job classes. Other disciplines specifically mentioned are structural, mechanical and industrial. (Table 7.6) In roughly half of the 55 job class categories, none of the job classes require a registered engineer (29 or 53%). Collectively, the categories that do not require a registered engineer account for a little less than half of all job classes (84 out of 194 or 43%). In a fifth of the job categories (11 or 20%), all of the job classes require a registered engineer and in another fifth, over half do. The job categories where all job classes require a registered engineer account for 12% of all positions. Thus, varying proportions of the remaining job classes (45%) require a registered engineer.

Job class categories requiring *100%* registered engineers include bridge, construction, drinking water, hydraulic, industrial, materials and research, mechanical and electrical, reclamation, registrar, seismic and subsidence engineering positions. Many of these positions involve practice act disciplines and their associated areas of expertise. Those requiring *no* registered engineers include air quality, air resources, automotive equipment stands, chemical testing, control, corrosion, energy and mineral resources, equipment, equipment and materials, flammability research test, geologist, hydroelectric power utility, mineral resources, mining, motor vehicle pollution control, petroleum, petroleum drilling, production and reservoir, petroleum and mining appraisal, pipeline safety, process safety, procurement, product, rehabilitation, reservoir, safety, telecommunications, and transportation civil engineering positions. Many of these positions involve title act or unregulated disciplines and their areas of expertise. (Table 7.6)

Table 7.7 describes the number of employees in positions where registration is either required or not required. Almost three-fourths (72%) of employees in engineering job classes are in positions where registration is *not* required. Most of the employees in engineering job classes where registration *is* required are in positions requiring a civil license (19%). (Table 7.7)

In short, most engineers employed by the State of California do not have to be licensed. If they do, the license most often required is in civil engineering.

Table 7.1. "Hits" in Title 16 of California Code of Regulations

Professional Engineer	27
Registered Professional Engineer	1
Licensed Professional Engineer	1
Civil Engineer	18
Geotechnical Engineer	6
Soils Engineer	3
Structural Engineer	17
Electrical Engineer	1
Mechanical Engineer	2
Agricultural Engineer	0
Chemical Engineer	0
Control Systems Engineer	0
Industrial Engineer	0
Fire Protection Engineer	0
Manufacturing Engineer	0
Metallurgical Engineer	0
Nuclear Engineer	0
Petroleum Engineer	1
Traffic Engineer	0

Table 7.2. Unedited References to Types of Engineers in Federal, State and County Codes of Regulation

	California Code of Regulations	San Francisco Municipal Code	Los Angeles County Code	San Diego County Code	Federal Code of Regulations
Professional Engineer	30.4	0.0	5.5	1.8	14.4
Registered Professional Engineer	10.1	2.3	2.8	5.3	57.5
Licensed Professional Engineer	1.3	0.0	0.0	0.0	5.5
Civil Engineer	29.5	40.9	26.6	38.6	7.9
Geotechnical (and Soil) Engineer	2.6	9.1	25.7	38.6	2.5
Structural Engineer	17.1	13.6	11.0	8.8	2.8
Electrical Engineer	3.5	6.8	3.7	1.8	0.6
Mechanical Engineer	3.3	13.6	5.5	0.0	0.6
Agricultural Engineer	0.0	0.0	0.0	0.0	0.0
Chemical Engineer	0.7	2.3	0.0	0.0	0.6
Control Systems Engineer	0.0	0.0	0.9	0.0	0.0
Fire Protection Engineer	0.7	11.4	1.8	0.0	3.0
Industrial Engineer	0.0	0.0	0.9	0.0	0.0
Manufacturing Engineer	0.0	0.0	0.0	0.0	0.0
Metallurgical Engineer	0.0	0.0	0.0	0.0	0.0
Nuclear Engineer	0.0	0.0	0.0	0.0	0.0
Petroleum Engineer	0.9	0.0	0.0	0.0	2.8
Traffic Engineer	0.0	0.0	15.6	5.3	1.7
	100.0	100.0	100.0	100.0	100.0
	n=457	n=44	n=109	n=57	n=471

Table 7.3. Edited References to Types of Engineers in State and Individual County Codes of Regulation

	California Code of Regulations	San Francisco Municipal Code	Los Angeles County Code	San Diego County Code
Professional Engineer	5.7	0.0	5.3	0.0
Registered Professional Engineer	17.6	3.8	5.3	6.1
Licensed Professional Engineer	2.6	0.0	0.0	0.0
Civil Engineer	34.7	38.5	36.8	44.9
Geotechnical (and Soil) Engineer	3.6	11.5	31.6	42.9
Structural Engineer	21.8	15.4	15.8	6.1
Electrical Engineer	5.7	3.8	3.5	0.0
Mechanical Engineer	4.1	11.5	0.0	0.0
Agricultural Engineer	0.0	0.0	0.0	0.0
Chemical Engineer	1.6	3.8	0.0	0.0
Control Systems Engineer	0.0	0.0	0.0	0.0
Fire Protection Engineer	1.0	11.5	0.0	0.0
Industrial Engineer	0.0	0.0	0.0	0.0
Manufacturing Engineer	0.0	0.0	0.0	0.0
Metallurgical Engineer	0.0	0.0	0.0	0.0
Nuclear Engineer	0.0	0.0	0.0	0.0
Petroleum Engineer	1.6	0.0	0.0	0.0
Traffic Engineer	0.0	0.0	1.8	0.0
	100.0	100.0	100.0	100.0
	n=193	n=26	n=57	n=49

Table 7.4. Types of References in State and County Codes of Regulation by Engineering Discipline

	California Code of Regulations	California County Codes Los Angeles, San Francisco, San Diego
Required Member of Board or Minimum Qualifications		
Professional Engineer	10.0	0.0
Civil Engineer	10.0	33.3
Geotechnical (and Soil) Engineer	0.0	11.1
Structural Engineer	20.0	33.3
Electrical Engineer	20.0	0.0
Mechanical Engineer	20.0	11.1
Chemical Engineer	10.0	0.0
Fire Protection Engineer	10.0	11.1
	100.0	100.0
	n=10	n=9
Restrictive Definitions		
Professional Engineer	22.2	0.0
Registered Professional Engineer	11.1	0.0
Civil Engineer	22.2	50.0
Geotechnical (and Soil) Engineer	22.2	50.0
Structural Engineer	22.2	0.0
	100.0	100.0
	n=9	n=12
Prescriptive Statements		
Professional Engineer	4.6	2.7
Registered Professional Engineer	19.0	6.3
Licensed Professional Engineer	2.9	0.0
Civil Engineer	36.8	39.6
Geotechnical (and Soil) Engineer	2.9	31.5
Structural Engineer	21.8	11.7
Electrical Engineer	5.2	2.7
Mechanical Engineer	3.4	1.8
Chemical Engineer	1.1	0.9
Fire Protection Engineer	0.6	1.8
Petroleum Engineer	1.7	0.0
Traffic Engineer	0.0	0.9
	100.0	100.0
	n=174	n=111

Table 7.5. Prescriptive References in State and Individual County Codes of Regulation by Engineering Discipline

	California Code of Regulations	San Francisco Municipal Code	Los Angeles County Code	San Diego County Code
Professional Engineer	4.6	0.0	6.3	0.0
Registered Professional Engineer	19.0	5.3	6.3	6.8
Licensed Professional Engineer	2.9	0.0	0.0	0.0
Civil Engineer	36.8	42.1	35.4	43.2
Geotechnical (and Soil) Engineer	2.9	10.5	27.1	45.5
Structural Engineer	21.8	10.5	18.8	4.5
Electrical Engineer	5.2	5.3	4.2	0.0
Mechanical Engineer	3.4	10.5	0.0	0.0
Chemical Engineer	1.1	5.3	0.0	0.0
Fire Protection Engineer	0.6	10.5	0.0	0.0
Petroleum Engineer	1.7	0.0	0.0	0.0
Traffic Engineer	0.0	0.0	2.1	0.0
	100.0	100.0	100.0	100.0
	n=174	n=19	n=48	n=44

Table 7.6. Summary of California State Personnel Board Engineering Job Class Registration Requirements

Engineering Job Class Category* (in alphabetical order)	Percent of Job Classes with Registration Requirement	Number of Job Classes with Registration Requirement										Number of Job Classes without Registration Requirement	Total Number of Job Classes
		Engineer or PE	PE or Civil	Civil	Civil or Structural	Structural	Electrical	Electrical or Mechanical	Mechanical	Mechanical or Industrial	Industrial		
Air Quality	0%											4	4
Air Resources	0%											1	1
Automotive Equipment Standards	0%											3	3
Bridge	100%			4									4
Chemical Testing	0%											2	2
Civil	55%			5								4	9
Construction	100%			4									4
Control	0%											5	5
Corrosion	0%											2	2
Drinking Water	100%			1									1
Electrical	36%						4					7	11
Electronics	33%						1					2	3
Energy and Mineral Resources	0%											1	1
Equipment	0%											3	3
Equipment and Materials	0%											1	1
Flammability Research Test	0%											1	1
Geologist	0%											5	5
Hazardous Substances	80%	4										1	5
Hydraulic	100%			4									4
Hydroelectric Power Utility	0%											5	5
Industrial	100%									1	1		2
Materials and Research	100%	2	1										3
Mechanical	40%								4			6	10
Mechanical and Electrical	100%							2					2
Mineral Resources	0%											3	3
Mining	0%											1	1

* For the information presented in this and the following table, engineering job classes were defined as those resulting from a search using the term “engineer” in the State Personnel Board’s online Classification Information Search System and which also had a minimum education requirement of a four-year college degree in engineering. Using this definition, 194 engineering job classes were identified. Education and registration requirements were obtained from the online classification specifications, which describe essentially similar jobs and include the qualifications for the job. The categories used in this table were constructed by ISR based on the job title in order to show the relative distribution of the classes and their registration requirements.

Table 7.6 (continued). Summary of State Personnel Board Engineering Job Classification Registration Requirements

Engineering Job Class Category (in alphabetical order)	Percent of Job Classes with Registration Requirement	Number of Job Classes with Registration Requirement										Number of Job Classes without Registration Requirement	Total Number of Job Classifications
		Engineer or PE	PE or Civil	Civil	Civil or Structural	Structural	Electrical	Electrical or Mechanical	Mechanical	Mechanical or Industrial	Industrial		
Motor Vehicle Pollution Control	0%											2	2
Oil and Gas	75%	3										1	4
Petroleum	0%											1	1
Petroleum Drilling	0%											1	1
Petroleum Production	0%											1	1
Petroleum Reservoir	0%											1	1
Petroleum Structures	33%				1							2	3
Petroleum and Mining Appraisal	0%											1	1
Pipeline Safety	0%											2	2
Process Safety	0%											3	3
Procurement	0%											3	3
Product	0%											2	2
Reclamation	100%			1								0	1
Registrar	100%	1										0	1
Rehabilitation	0%											2	2
Reservoir	0%											1	1
Safety	0%											22	22
Sanitary	75%	3										1	4
Seismic	100%			1								0	1
Structural	86%			1		5						1	7
Subsidence	100%			1								0	1
Telecommunications	0%											4	4
Transportation	86%	1		5								1	7
Transportation Civil	0%											1	1
Transportation Electrical	50%						3					3	6
Utilities	67%	2										1	3
Waste Management	75%	3										1	4
Water Resources	75%			3								1	4
Water Resources Control	83%		5									1	6
Total	40%	19	6	30	1	5	8	2	4	1	1	117	194

Table 7.7. Distribution of California Permanent Civil Service Employees among Engineering Job Classes with and without Engineering Registration Requirements

		Percent	*Number*
Registration required	Engineer or PE	2.1%	*227*
	Engineer or PE required for advancement to highest pay range	1.2%	*126*
	PE or civil	4.2%	*462*
	Civil	18.9%	*2,065*
	Civil or Structural	.0%	*2*
	Structural	.9%	*99*
	Electrical	.9%	*95*
	Electrical or Mechanical	.0%	*2*
	Mechanical	.1%	*11*
	Industrial or Mechanical	.0%	*1*
	Industrial	.0%	*0*
No registration required		71.7%	*7,833*
Total Employees		100.0%	*10,923*

Information compiled from California State Personnel Board Report 5102, which shows the number of Permanent Civil Services Employees as of 12/31/01.